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UNITED STATES DEPARTMENT OF AGRICULTURE

BULLETIN No. 386

Contribution from Office of Public Roads and Rural Engineering
LOGAN WALLER PAGE, Director

Washington, D. C. ▼ September 11, 1916

PUBLIC ROAD MILEAGE AND REVENUES IN THE MIDDLE ATLANTIC STATES, 1914

A COMPILATION SHOWING MILEAGE OF IMPROVED AND UNIMPROVED ROADS; SOURCES AND AMOUNTS OF ROAD REVENUES; BONDS ISSUED AND OUTSTANDING; AND A DESCRIPTION OF THE SYSTEMS OF ROAD ADMINISTRATION AND FISCAL MANAGEMENT, AND OF OTHER FACTORS AFFECTING ROAD IMPROVEMENT IN EACH STATE

PREPARED JOINTLY BY THE DIVISION OF ROAD ECONOMICS AND THE STATE COLLABORATORS OF THE OFFICE OF PUBLIC ROADS AND RURAL ENGINEERING

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A Compilation Showing Mileage of Improved and Unimproved Roads; Sources and Amounts of Road Revenues; Bonds Issued and Outstanding; and a Description of the Systems of Road Administration and Fiscal Management, and of other Factors Affecting Road Improvement in Each State.

Prepared Jointly by the Division of Road Economics and the State Collaborators of the Office of Public Roads and Rural Engineering.

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INTRODUCTORY.

Beginning with 1904, the policy was adopted by the Office of Public Roads of conducting investigations at five-year intervals to determine the mileage of improved and unimproved roads, the revenues for road purposes, and other related data. In accordance with that policy, Bulletin No. 32 was issued, giving such information as was obtainable for the calendar year 1904, and Bulletin No. 41 was issued, giving such information as was available for the calendar year 1909. The investigation made for the year 1914 followed somewhat different lines, since a closer cooperation with State highway departments had been established, and wherever practicable the information was directly collected by collaborators named by the respective State highway departments and acting under specific instructions from this office. This policy was not practicable in connection with the earlier bulletins, owing to the fact that many of the States have only recently established highway departments.

NOTE.—This bulletin is of interest to all users of public roads and those who are concerned with road maintenance.

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For convenient reference the information obtained from the Middle Atlantic States of New Jersey, New York, and Pennsylvania is published in this bulletin, leaving the remaining States to be dealt with by groups in subsequent similar publications. These groups have been selected according to their administrative organization for road purposes and according to other conditions affecting road management.

In order that the statistics may be useful in the highest degree, an explanatory text has been prepared for each State. In connection with the explanation of these statistical tables, the systems of administration, the methods of financing road work, the physical conditions influencing road improvement, and the progress made in recent years in the construction of roads and bridges, are set forth in the explanatory chapters.

WORKING PLAN AND SOURCES OF INFORMATION.

The method of procedure followed in obtaining the information contained in this bulletin was as follows:

A series of card-inquiry forms, designated A, B, C, and D, covering respectively mileage, taxation and revenues, administrative organization, and bond issues, was prepared and submitted to the various State highway departments for suggestion and approval. After changes were made to meet conditions found to be peculiar to the individual States, supplies of the card forms, with necessary stationery, were sent to each State collaborator, and correspondence was then conducted under Government frank with the respective county and township officials by the collaborators. In many instances it was impossible for the collaborators to obtain replies from all local officials, and accordingly letters and forms were sent directly from this office to such local officials. During the course of the investigation it was found necessary to enlist the aid of local and State road associations, chambers of commerce, automobile clubs, postmasters, and private individuals in order to obtain adequate information. On account of the absence of detailed records in many of the towns and counties, extreme accuracy is impossible, and because of the large amount of correspondence necessary to conduct the investigation, considerable delay in the issuance of the bulletins has been unavoidable. The data on mileage and revenues should therefore be considered as approximate only.

A summary sheet for each of the forms A, B, C, and D was prepared for each State at the outset of the investigation, and as the card forms were received from local officials or from the State collaborators, the information was entered on the summary sheets under appropriate headings. These summaries, when completed, were forwarded

to the respective State collaborators or to the heads of the State highway departments, who thereupon prepared a text explanatory of the statistical tables and of the administrative systems in effect in their respective States, or approved a text prepared in this office.

ROAD ADMINISTRATION IN THE MIDDLE ATLANTIC STATES.

All of the Middle Atlantic States have highway departments and apply State funds to the aid of road improvement. This policy was inaugurated in New Jersey in 1892, in New York in 1898, and in Pennsylvania in 1903. In New York and Pennsylvania the construction and maintenance of all roads is in a measure under State control. New York has developed a rather highly centralized highway department, and, like Pennsylvania and New Jersey, has a comprehensive system of State highways, for the construction and maintenance of which State funds are appropriated.

PUBLIC ROAD REVENUES.

State road funds in New York were at first provided by direct appropriations and at the beginning of 1906 amounted to $25,000,000. During that year, a $50,000,000 State bond issue was authorized, and a second issue of $50,000,000 in 1912. Of the total bonds authorized, $65,000,000 were issued on authority of the legislature to the close of the year 1914. In New Jersey and Pennsylvania State funds are provided by direct appropriations from the State treasury. Aside from the State-aid funds a considerable portion of the revenues for roads is provided by taxes, levied by the towns in New York State, by counties and townships in New Jersey, and by townships in Pennsylvania. Approximately one-third of all expenditures are provided by local units in New York and about one-half in New Jersey and Pennsylvania.

Table 1 presents in condensed form the information assembled concerning road expenditures and road bonds for New York, New Jersey, and Pennsylvania:

TABLE 1.—*Road expenditures and road bonds, 1914.*

State.	Total expenditures, 1914.	Road bonds voted or outstanding to December 31, 1914.	
		County, town, and township.	State.
New York	$23,231,964	$11,822,088	[1] $100,000,000
New Jersey	7,208,287	14,011,337	.....
Pennsylvania	10,424,580	27,547,659	.....
Total	40,864,831	53,381,084	100,000,000

[1] Of which $65,000,000 was issued to Dec. 31, 1914.

An interesting comparison showing the average expenditure for roads and bridges in these three States per mile of road, per square mile of area, per 1,000 population, and per $100 of assessed valuation for the years 1904 and 1914 is presented in Table 2. This average does not indicate the distribution of expenditures, as it includes both construction and maintenance. Accordingly there may be many miles on which little or nothing was expended. The average, however, indicates the comparative financial burden proportionate to mileage.

TABLE 2.—*Analysis of expenditures on various bases.*

State.	Per mile of road.		Per square mile of area.		Per 1,000 of population.		Per $100 assessed valuation.	
	1904	1914	1904	1914	1904	1914	1904	1914
New Jersey	$220.64	$486.49	$435.00	$959.00	$1,730.00	$2,833.00	$0.34	$0.289
New York	77.05	292.60	114.00	467.00	790.00	2,549.00	.095	.208
Pennsylvania	48.98	113.86	109.00	232.00	770.00	1,360.00	.124	.205

ROAD MILEAGE, 1914.

The total road mileage in the Middle Atlantic States to January 1, 1915, was 185,770.84, of which 31,516.23 miles, or 16.9 per cent of the total, were surfaced. This does not include streets in incorporated cities and towns, except a few miles in New York and Pennsylvania where the State roads pass through the small towns and boroughs. By comparing these figures with former investigations in the same States, it appears that between 1909 and 1914, 11,942.80 miles, or 6.4 per cent of the total, were surfaced. Table 3 summarizes all of the available information concerning road mileage for the three States.

TABLE 3.—*Road mileage, 1909 and 1914.*

State.	Total road mileage.	Miles surfaced.	Miles surfaced from 1909 to 1914.	Percentage surfaced.		Increase over 1909.
				1909	1914	
						Per cent.
New York	79,398.00	15,635.90	2,848.9	16.13	19.6	3.5
New Jersey	14,817.00	5,897.45	2,475.9	22.76	39.8	17.0
Pennsylvania	91,555.84	9,982.88	6,618.0	5.84	10.9	7.0
Total	185,770.84	31,516.23	11,942.8	14.91	16.9	6.4

A diagram (fig. 1) shows the percentage of surfaced roads for these States at the close of the years 1904, 1909, and 1914. This diagram shows in a striking manner the strides which have been made during the past 10 years in road construction in these States.

The total mileage of roads and the surfaced mileage in relation to the square mile of area and 1,000 population for the years 1904, 1909, and 1914 are shown in Table 4.

TABLE 4.—*Analysis of mileage on various bases.*

State.	Total mileage.						Surfaced mileage.					
	Per square mile area.			Per 1,000 rural population.			Per square mile area.			Per 1,000 rural population.		
	1904	1909	1914	1904	1909	1914	1904	1909	1914	1904	1909	1914
New Jersey	1.97	1.97	1.97	26.74	23.6	23.5	0.32	0.45	0.784	4.4	5.4	9.4
New York	1.54	1.67	1.66	37.44	41.1	41.2	.12	.268	.328	2.98	6.6	8.1
Pennsylvania	2.21	1.95	2.22	34.9	28.8	30.17	.048	.075	.22	.76	1.11	3.29

DEVELOPMENT OF NEW TYPES OF HIGHWAY.

On account of the rapid increase in motor-vehicle traffic and the fact that more study is being devoted to the selection of types best adapted to traffic needs, the types of road surfaces have undergone considerable changes during the past 10 years. To illustrate this

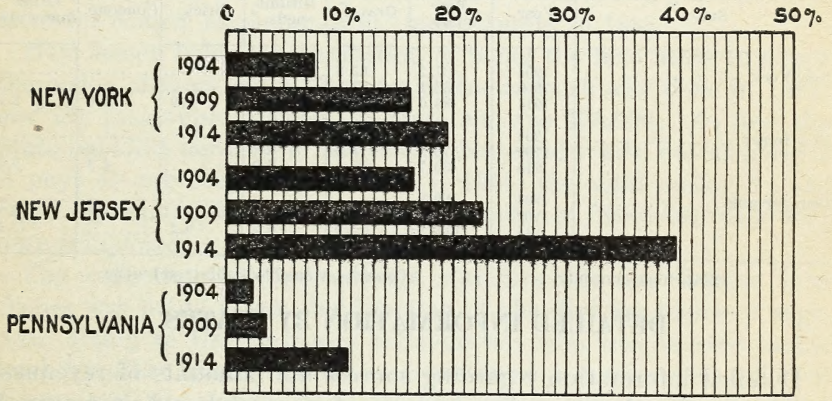

FIG. 1.—Percentage of surfaced roads in New York, New Jersey, and Pennsylvania for the years 1904, 1909, and 1914.

point it may be stated that of the 10,485 miles of surfaced roads in the Middle Atlantic States in 1904, approximately 60 per cent was plain macadam and 40 per cent was gravel. In 1909, of the 19,532 miles of surfaced road, 51 per cent was macadam, 47 per cent gravel, 1 per cent bituminous macadam, and 1 per cent other materials. In 1914, however, of a surfaced mileage of 24,482, 39.3 per cent was macadam, 36.3 per cent gravel, 15.4 per cent bituminous macadam, 3.8 per cent brick and concrete, and 5.2 per cent of other materials. It should be stated, however, in this connection that the 24,482 miles do not represent the total mileage of surfaced roads in 1914, as in the case of Pennsylvania it was impossible to secure detailed information regarding the type of surfaced roads in second-class townships. The decrease in the percentage of macadam roads from 51 per cent

in 1909 to 39.3 per cent in 1914 was due to the fact that many of these roads have been surface-treated and are now classed as bituminous macadam or bituminous-treated roads.

Of the 11,942.8 miles surfaced from the close of 1909 to the close of 1914, 9,629.82, which excludes second-class township roads in Pennsylvania, are classified as follows: 3,539.15, or 37 per cent, were treated with bitumen in some form; 1,992.75, or 20.5 per cent, were plain macadam; 2,501.32, or 26 per cent, were plain gravel; 485.95, or 5 per cent, were brick or concrete; and 1,110.65, or 11.5 per cent, were of other materials. This indicates conclusively that in the sections of country where heavy automobile traffic prevails, the old standard type of waterbound macadam has had its day.

Detailed information on the mileage of improved surfaces, by years and States, is shown in Table 5.

TABLE 5.—*Percentage by types of surfaced-road mileage.*

State.	Year.	Macadam.	Gravel.	Bituminous.	Brick.	Concrete.	Other materials.
New York	1904	37.2	62.8				
	1909	36.1	63.9				
	1914	38.0	37.1	20.0	1.0	1.6	2.2
New Jersey	1904	78.4	17.2				
	1909	76.8	17.0	6.2			
	1914	30.7	48.5	7.0		4.3	9.5
Pennsylvania	1904	100.0					
	1909	82.1	13.0				4.9
	1914	[1] 63.9	[1] 7.9	[1] 6.7	[1] 9.1		[2] 12.4

[1] State highways only. [2] Concrete, stone block, flint, and stone.

DETAILED INFORMATION BY STATES.

Detailed information regarding sources and amounts of revenues, bonds issued and outstanding, mileage of improved and unimproved roads, systems of administration, and other factors affecting road improvement are presented in the following chapters for New York, New Jersey, and Pennsylvania, respectively.

NEW JERSEY.

By E. M. VAIL, *U. S. Collaborator.*

New Jersey is one of the most thickly populated States in the Union and consequently has more wealth and more miles of roads to the square mile of area than most of the other States where towns and cities and their connecting highways are of more recent construction.

The first roads of New Jersey were merely bridle paths or Indian trails. These were crooked and circuitous, and as the years passed they were widened with the increasing westward trend of settlement

and became in the end the foundation of the present-day system of highways. It was not until 1676 that any attention was given to the proper construction and maintenance of roads. As the State was all apportioned when the Government took up the town, township, and section method of laying out public lands, nothing was done in this line in New Jersey. In the early days private companies built turnpikes, many of which were laid straight without regard to grade. Consequently, the rebuilding of these roads in recent years so that they will be wide and straight, with good grades, has been a heavy expense.

The first public work on roads appears to have been conducted by local committees and gave rise to the general practice of working out the poll tax. This system of working out poll tax, however, has been abandoned during recent years.

In the county of Essex a small amount of county road work appears to have been done about 1868 to 1870. Nevertheless, the inhabitants of New Jersey traveled mostly on township roads until a general movement for county roads began in Union County in 1888.

New Jersey holds the distinction of being the first State to adopt the policy of State aid. The first State-aid work was done in 1892, and the first appropriation for State aid was $75,000. At first the State paid 33⅓ per cent of the cost of State-aid roads, but at present it pays 40 per cent. Up to July 1, 1914, the total outlay by the State aggregated $5,800,000 and 1,833 miles of State-aid roads had been completed.

The collection of road mileage statistics and its division into classes was made under the direction of the division highway engineer, acting as United States collaborator, who was assisted in his work by other employees of the department of public roads of New Jersey and by county engineers and other county officials. The data upon which the expenditure and bonding tables were compiled were furnished by the office of the comptroller of the treasury of New Jersey, and the tables were made up from these data by employees of the Office of Public Roads and Rural Engineering.

Maps were obtained of all sections of the State and the length of the roads scaled by the State collaborator. Where these lengths were later checked by actual measurement, the results were very close. From most of the counties the engineers furnished accurate information of the work under their charge. In a few cases the townships had these data, but in most cases the best posted citizens indicated on the roads of their districts the general class and quality of pavement, if any, upon which the estimates for each township were based. In a few townships, however, the classes of roads had to be averaged with the classes of the adjoining townships. In order to complete the total mileage figures of roads and streets,

similar information was also obtained from the cities, boroughs, and other municipalities. This shows a total mileage of 20,445.

New Jersey has an area of 7,414 square miles of land and 710 square miles of water, making an average of 2.72 miles of roads per square mile of area. The State is divided into three belts—the northwestern or hilly country, from which trainloads of dairy products enter the large cities each day; the central, or marl belt, from which comes the name "Garden State"; and the southern, the flat sandy region formerly considered the pine barrens, though by the introduction of drainage and overhead irrigation in late years it has become a rich farming and trucking region. As this section is near the large cities of New York and Philadelphia, it has excellent markets.

Few people not residing close to the large cities will realize the additional cost, not only of construction but of maintenance, which is required to keep in repair roads carrying a traffic of, say, 2,000 vehicles or 6,000 tons daily. They wonder that a State as small as New Jersey should have so large a mileage of roads, constructed and maintained at so great an expense. This is explained by the fact that it lies between New York and Philadelphia, the two largest cities on the Atlantic seaboard, and is composed largely of suburban homes and manufacturing districts contiguous to these cities. New Jersey itself contains several large manufacturing cities.

In 1914, according to State registration, there was an average of 1 automobile for every 40 population and 6 automobiles for every mile of road. This heavy traffic is a severe tax on the roads, and it will, therefore, be seen that the cost of maintenance is necessarily large. Also, there are a number of motor-vehicle manufacturing concerns in New Jersey. When it is taken into consideration that every new vehicle must be tried out on the roads, it will be seen that this is an additional tax on their ability to sustain the traffic. This is especially true of the heavy motor trucks.

Some of the manufacturing cities of North Jersey are connected by roads constructed over the tide marshes. These roads have been under construction for a period of 100 years or more. The first step was to form corduroy out of the logs and branches of trees. Later planking was resorted to, and in recent years from 4 to 6 feet of earth and cinders have been filled in on top. Owing to the fact that these are practically pontoon roads, much of the material sinks below the surface of the water, or shoves out to the sides, so that perhaps 3 yards must be furnished for an apparent gain of 1 yard of fill. Upon this fill are constructed the most expensive types of pavement. Some of these roads are now so solid that they are carrying two lines of street cars, wide carriageways, and sidewalks.

The East Jersey coast forms an almost continuous chain of residential sections and pleasure resorts. This vast playground is fast becoming an all-year-round resort. As the surf bathing is one of the chief attractions, many cities are built on the low bars of sand which have been thrown up by the violence of the sea. Behind these bars are swampy sections and inlets. Roads across these sections are frequently built on fills many feet in depth, composed of material dredged from nearby streams and waterways. In order to form a solid roadway the original work is quite wide and the amount of material required to fill one of these roads is a mere conjecture. The slopes are frequently protected by sod or are planted with tufts of coarse grass.

What are known as sand-clay roads in New Jersey are constructed of second-quality gravel, engine cinders, or some other local product not listed in the standard specifications. These roads cost about $1,000 a mile for grading and another $1,000 for surfacing, or about $2,000 per mile. Many of these roads are only paved for a width of 12 feet. Gravel roads, however, are from 14 to 40 feet in width and cost from $2,500 to $10,000 per mile.

Macadam roads in New Jersey are seldom less than 12 feet in width and 3 or 4 inches deep. In the wealthier districts they are 18 and 20 feet in width and from 8 to 12 inches deep, with 30 to 40 feet graded carriageways. They cost from $5,000 to $20,000 a mile, depending on the amount of grading and the depth of the pavement.

Asphalt macadam is seldom less than 16 feet in width, and in some cases it is as much as 60 feet in width. These roads cost from $18,000 to $125,000 per mile.

Block and brick roads in New Jersey are practically all laid on concrete foundations, and as they are almost always constructed where they are subject to the heaviest traffic, this class of road may be figured to cost not less than from $40,000 to $50,000 per mile.

While it is impossible to estimate exactly the cost of roads in New Jersey, the cost, based on the above figures, has, however, been roughly figured at a total of $140,000,000.

EXPENDITURES.

The total expenditure for road and bridge construction and maintenance, and for interest and redemption of road and bridge bonds, for the year 1914 amounted to $7,208,287. Of this amount $3,542,572 was expended on State-aid roads for construction and maintenance, of which the State's share was $1,306,596 and the share paid by the local units was $2,235,976. State money available for expenditure during 1915 for construction and maintenance of State-aid roads amounted to $1,360,000. From 1891 to January 1, 1915, the total

expenditure by the State for State-aid road construction and maintenance amounted to $7,192,268. In 1904 the total expenditure for public roads amounted to $3,274,811, of which the State's share was $250,000. Thus in 1914 the total expenditures had increased 120 per cent as compared with 1904 and the State's share toward construction and maintenance increased 422 per cent. Information regarding expenditures is shown in detail by counties in Table 6.

TABLE 6.—*Expenditures on roads and bridges in New Jersey, 1914.*

[From townships report compiled from figures in annual report of comptroller of the treasury, 1914. Checked by New Jersey collaborator.]

County.	Expenditures on roads and bridges, 1914.			Interest and redemption on road and bridge bonds and notes.	Total expenditures.
	Road maintenance.	Road construction.	Bridges.		
Atlantic	$109,760.32	$15,611.35	$41,541.91	$40,030.00	$206,943.58
Bergen	138,846.44	366,159.01	144,748.40	89,200.00	738,953.85
Burlington	10,378.63	82,282.94	60,743.78	35,199.43	188,604.78
Camden	29,979.94	80,101.07	65,576.53	44,935.11	220,592.65
Cape May	30,050.16	87,706.27	19,402.23	17,631.45	154,790.11
Cumberland	2,190.25	48,255.84	33,165.63	15,717.50	99,329.22
Essex	210,941.16	393,571.70	186,143.66	658,984.97	1,449,641.49
Gloucester	20,747.17	105,062.92	53,577.61	32,156.51	211,544.21
Hunterdon	16,844.04	176,538.21	32,025.50	8,317.00	233,724.75
Hudson	229,472.76	94,844.36	47,591.39	648,055.01	1,019,963.52
Mercer	86,448.16	156,590.21	51,563.35	48,387.25	342,988.97
Middlesex	86,097.01	93,347.97	60,813.57	90,149.68	330,408.23
Monmouth	111,055.88	139,271.12	116,767.54	7,395.66	374,490.20
Morris	133,171.08	105,225.63	30,856.40	12,000.00	281,253.11
Ocean	6,141.79	89,069.04	23,461.68	10,126.18	128,798.69
Passaic	133,455.37	193,675.62	40,020.04	58,640.48	425,791.51
Salem	7,500.00	47,175.44	53,813.55	7,000.00	115,488.99
Somerset	21,782.92	84,537.08	42,319.53	3,712.50	152,352.03
Sussex	6,263.04	105,868.44	9,138.48	7,004.00	128,273.96
Union	34,546.81	97,154.13	57,531.74	81,522.18	270,754.86
Warren	29,568.26	77,177.17	23,668.82	3,184.12	133,598.37
Total	1,455,241.19	2,639,225.52	1,194,471.34	1,919,749.03	7,208,287.08

According to the report of the comptroller of the treasury of New Jersey, the total county and township road and bridge bonds outstanding on November 30, 1914, amounted to $14,011,337. Most of the bonds are deferred serial in character and the interest rates vary from 4 per cent to 5 per cent. Information showing the total bonds outstanding by counties and townships, with interest rates and the term of the bonds, is presented in Table 7.

TABLE 7.—*Outstanding road and bridge bonds, New Jersey, Nov. 30, 1914.*

County.	Township.	Bonds outstanding.	Rate of interest.	Fall due.
			Per cent.	
Atlantic		[1] $402,000.00	4½ to 5	Various years up to 1957.
Bergen		1,679,000.00	3½ to 5	Various dates.
	Township of Overpeck and Ridgefield Park Village.	25,000.00	.....	
	Franklin	5,500.00	.....	Do.
	Hillsdale	42,500.00	5	Do.
	Midland	9,000.00	5	Do.
	Orvil	6,000.00	5	$1,000 each year.
	River Vale	28,500.00	5	Do.
	Saddle River	75,000.00	5	A portion every 5 years.
	Union	42,500.00	4	1920.
	Washington	12,000.00	5	1934–35.
Burlington		74,322.76	4 to 4½	Various dates up to 1934.
	Chester	20,000.00	4½	Various dates.
	Lumberton	9,000.00	5	Various dates after 1916.
	New Hanover	27,000.00	4½	Various dates.
	North Hanover	14,000.00	4½	Do.
	Pemberton	29,000.00	4½	Do.
	Southampton	11,500.00	4½	Do.
	Willingboro	3,500.00	5	1 to 15 years.
Camden		464,100.00	4⅛ to 4½	20, 25, and 30 years.
	Gloucester	2,000.00	5	Various years.
	Haddon	1,200.00	5	Various dates.
	Voorhees	2,500.00	5	1920.
Cape May		355,500.00	4½ to 5	Various dates.
	Lower	1,500.00	.....	1915.
Cumberland		[1] 204,000.00	5	Various dates after 1915.
	Downe	5,000.00	5	1924.
Essex		2,202,000.00	4½ to 5	
Gloucester		253,400.00	4½ to 5	1915 to 1939.
	Woolwich	2,600.00	5	1915 and 1916.
Hudson		4,261,672.00	4 to 4½	Various dates to 1964.
Hunterdon		318,000.00	4	30 years from date of issue.
	Bethlehem	2,492.58	5	1920.
	Kingwood	6,800.00	4	1917 to 1923.
	West Amwell	2,600.00	4½	1916 to 1923.
Mercer		555,150.00	3½ to 4½	1916 to 1944.
Middlesex		774,800.00	4 to 4½	1915 to 1949.
Monmouth	Neptune	17,000.00	4 to 5	1920.
Morris		280,000.00	4	
Ocean		36,000.00	5	1933.
	Long Beach	8,000.00	5	1922.
Passaic		879,500.00	4 to 5	1914 to 1931.
Salem		30,000.00	4	Various dates.
	Quinton	1,700.00	5	1915.
Sussex		196,100.00	4	1938 to 1944.
Union		600,000.00	4 to 4½	Sinking fund.
	Cranford	4,100.00	5	Various dates.
	Union	6,000.00	4½ to 5	1915 to 1920.
Warren		10,000.00	4	Various dates.
	Blairstown	5,000.00	4	1915 to 1919.
	Knowlton	2,300.00	5	Call.
	Mansfield	5,000.00	5	
Total		14,011,337.34		

[1] Partly for county buildings.

ROAD MILEAGE.

At the close of 1914 New Jersey had a total of 14,817.19 miles of public road, of which 5,897.45 miles, or 39.8 per cent, were surfaced. Of the surfaced roads 1,809.24 miles were plain macadam, 417.63 miles bituminous macadam, 2,858.52 miles gravel, 561.40 miles sand-clay, and 250.67 miles surfaced with other material, such as brick, concrete, asphalt concrete, stone, and asphalt block.

In 1904 New Jersey had 2,422.3 miles, or 16.32 per cent, of her total mileage surfaced. In 1909 she had 3,377 miles, or 22.75 per cent, of surfaced roads, while in 1914 she reports 5,897.45 miles, or 37.8 per cent of the total miles surfaced, thus showing that during the 5-year period 1909 to 1914, 2,475.99 miles of road, or 17 per cent of the total mileage, were surfaced. Information showing the total road mileage and mileage improved in the various counties is contained in Table 8, which does not include city streets. These are included in Table 9, which is supplementary and is given because New Jersey is, to a very great extent, urban in character, and the street and country-road problems are closely interwoven. Table 9 is copied from the Twenty-second Annual Report of the Commissioner of Public Roads, 1915.

TABLE 8.—*Mileage of all public roads in New Jersey, State and local, outside of incorporated cities, 1914.*

County.	Total mileage, all roads.	Surfaced roads.					Total surfaced roads.	Percentage of all roads surfaced.	Increase or decrease (—) in surfaced road mileage over 1909.	Graded and drained earth roads.
		Macadam, plain.	Macadam with bitumen.	Gravel.	Sand clay (mixed).	Other hard-surfaced roads.				
Atlantic	806.86	1.54		404.01		11.31 bituminous concrete	416.86	51.6	299.26	145
Bergen	435.45	176.97	6.60		1.50	30.92 bituminous concrete, brick, and stone block	215.99	49.5	—154.01	195.53
Burlington	1,368.35	87.60	79.40	108.30	48	4.10 bituminous concrete and cobble and 14.60 miles of shell.	342	25.2	83	199.50
Camden	546.56	53.49		155.11	62	23.96 bituminous concrete	294.56	53.9	114.99	41
Cape May	359			264			264	73.6	190.67	20
Cumberland	541			369			369	68.2	362.48	23
Essex	280.49	198.64	24			21.55 bituminous concrete, stone block, and asphalt block	244.19	87.0	—427.81	29.80
Gloucester	835.74	32.48	18.39	299.87	97	23 shell	470.74	56.4	384.50	90
Hudson	74.43	24.72	15			28.61 bituminous concrete, brick, wood, stone, and asphalt block.	68.33	91.9	34.33	3
Hunterdon	990	85.87	30.03				115.90	11.6	73.65	468.50
Mercer	474.22	140.46	19.26		41.50		201.22	42.4	— .49	259.50
Middlesex	677.39	164.01	16.19	65.66		5.36 bituminous concrete, brick, and stone block	251.22	37.1	53.88	398.58
Monmouth	1,271.08	64.95	1	619.13	172.70		857.78	67.5	667.78	168.50
Morris	1,016.08	116.58	91.28			0.98 concrete and 0.24 brick	209.08	20.7	46.64	420
Ocean	1,276.50	4.20	8	285.30	41		338.50	26.5	270.50	496
Passaic	463.78	168.30	56.87				225.17	48.6	— 4.39	212.61
Salem	659.56	4.50	1.99	285.137	97.70	42.865 shell and 0.775 concrete	432.96	65.6	410.70	226.60
Somerset	725.60	233.50	4.50				238	32.8	137.94	346.40
Sussex	976.63	52.65	22.38	1			76.03	7.8	46.03	536.80
Union	285.09	107.68	8.36			42.40 bituminous concrete, brick, and stone block	158.44	55.6	— 48.56	80.90
Warren	753.38	91.10	14.38	2			107.48	14.2	42.66	382.40
Total	14,817.19	1,809.24	417.63	2,858.52	561.40	250.67	5,897.45	39.8	2,475.99	4,743.62

TABLE 9.—*Mileage of public roads, including city streets in New Jersey, in 1914.*

Name of county.	Roads.		City streets.					
	County roads.	Township roads.	Borough roads.	Town roads.	Village streets.	City streets.	Toll roads.	Estimated mileage.
Atlantic	153.86	653	30.25	180	.....	236.65	.....	1,253.76
Bergen	45.95	389.50	776.81	.....	37.40	49.70	5	1,304.36
Burlington	215.90	1,152.45	14.75	.....	.....	41	.....	1,424.10
Camden	97.56	449	102.29	.....	.....	349.36	.....	998.21
Cape May	106	253	108.20	.....	.....	114.64	.....	581.84
Cumberland	29	512	30.25	.....	.....	136.85	12	720.10
Essex	160.69	119.80	39.90	349.44	52	355.70	.....	1,077.53
Gloucester	94.74	741	127.75	.....	.....	21.63	11	996.12
Hudson	42.80	31.63	9.10	126.34	.....	287.67	4	501.54
Hunterdon	61.90	928.10	44.60	4	.....	11	.....	1,049.60
Mercer	150.72	323.50	33.03	.....	.....	136.20	.....	643.45
Middlesex	238.04	439.35	126.60	.....	.....	130.47	.....	934.46
Monmouth	220.89	1,050.20	221.70	13.10	.....	100.20	.....	1,606.09
Morris	152.08	864	79.70	66.64	.....	.....	.....	1,162.42
Ocean	103.50	1,173	60.40	.....	.....	.....	.....	1,336.90
Passaic	203.14	260.64	75.01	.....	.....	212.82	.....	751.61
Salem	68.01	591.55	18.66	.....	.....	16.20	6.40	700.82
Somerset	113.50	612.10	68.44	7	.....	.....	.....	801.04
Sussex	39.83	936.80	34	.....	.....	.....	.....	1,010.63
Union	67.66	217.43	120.42	68.25	.....	308.72	.....	782.48
Warren	66.18	687.20	17	38	.....	.....	.....	808.38
Total	2,431.95	12,385.25	2,138.86	852.77	89.40	2,508.81	38.40	20,445.44

	Miles.
Total for roads	14,817.19
Total for streets	5,628.24
Grand total	20,445.44

NEW YORK.[1]

New York, with a land area of 47,654 square miles, has 1.66 miles of road per square mile of area. According to the 1910 census 4,766,883 out of a total population of 9,113,614, or 52.3 per cent, lived in the city of New York, and the urban and rural population was, respectively, 7,185,494 and 1,928,120, or 78.8 per cent and 21.2 per cent, thus indicating the predominance of urban interests in the working out of the highway problem. There are 62 counties, varying in size from St. Lawrence, the largest, with an area of 2,880 square miles, to Schenectady, the smallest, with an area of 221 square miles. The counties of Bronx, Kings, New York, Queens, and Richmond are not considered in this report, as they are included within the city limits of New York City.

The topography of the State is varied and ranges from sand plains to low-lying granite mountains.

The good-roads movement in the State of New York dates back to 1898, when the Higbie-Armstrong law was passed. Under this law 50 per cent of the cost of highways was to be borne by the State, 35 per cent by the county, and 15 per cent by the towns through which the road passed. After completion, the roads were maintained

[1] S. D. Gilbert, auditor, and other members of the State highway department, rendered valuable assistance in the work for this State. The figures were checked by the United States collaborator at Albany, J. Burr Ryder.

under the supervision of the State engineer and surveyor at the expense of the towns. This method proved a failure, as the maintenance of various sections of a road depended on the wealth of the towns in which they were located and also on the efficiency of the respective town officials.

By the laws of 1913 the highway department was reorganized under a single head in lieu of the commission which had included other State officers as members. The State commissioner of highways is appointed by the governor, by and with the advice and consent of the senate, for a term of 5 years. He has general supervision of all highways and bridges which are constructed, improved, or maintained in whole or in part by State money. His salary is fixed by the governor at not to exceed $10,000 per annum. He appoints three deputies, a secretary, nine division engineers, and all necessary assistant engineers and clerks.

The organization of the department is as follows: Commissioner, first deputy commissioner, second deputy commissioner, and third deputy commissioner, secretary, and auditor.

The law makes the commissioner responsible for all expenditures of the department and the proper execution of each contract. The State is divided into nine divisions, each under a division engineer in charge of the construction and maintenance of such road work as comes under the supervision of the State highway department. The highway department has under its supervision over 79,000 miles of road.

The highway improvement bonds were authorized in two amounts of $50,000,000 each in 1906 and 1912, respectively. The term of these bonds is 50 years. Of the $100,000,000 authorized, $65,000,000 have been sold. The amount derived from the sale of State bonds is fixed by the legislature. For the year 1914, $10,000,000 worth of State bonds were sold.

There are two classes of funds used for highway work. One is deposited with the State treasurer and is subject to the comptroller's check; the other is deposited with the county treasurer. The former, known as the highway improvement fund, is obtained from the sale of highway improvement bonds and the latter, called the general fund, is appropriated from the revenues of the State.

The highways of New York State are grouped in four classes, as follows: State highways, county highways, county roads, and town highways. The State and county highways together constitute the State system, and the town highways belong to the class of local roads which are aided and supervised by the State. The State has no supervision over county roads. State highways are those built at the sole expense of the State. They consist of about 3,800 miles of road on 45 routes prescribed by the legislature. The construction of these

highways is paid for from the proceeds of the sale of the State highway bonds. The maintenance is under the highway department, but is paid for by both the State and the towns through which they pass.

County highways are those built at the expense of both the State and county. These serve as the principal market routes within the counties. The State highway commissioner has designated 8,380 miles of these roads for the State. The total amount of State and county highways is nearly 12,000 miles. The State's share of the construction cost of county highways is paid from the appropriation made by the legislature from the fund derived from the sale of State highway bonds. The counties pay variable proportions of the cost of these roads and the balance is paid by the State. County highways are maintained in the same manner as State highways.

County roads are built at the sole expense of the county and are subject to the jurisdiction of the county officials. Inasmuch as the State grants aid for the maintenance of these roads, they are to a certain extent subject to the regulations of the State highway department. These roads are maintained from funds appropriated for this purpose, aided by a grant from the State's general fund amounting to 50 per cent of the county appropriation of the previous year for this purpose. However, no county receives from the State for this purpose in any one year an amount to exceed one-tenth of 1 per cent of the total taxable property in the county. Town highways are all roads outside of the limits of incorporated villages and cities which do not belong to the State and county system or to the county road systems. They are maintained and constructed by a joint State and town fund. When a town desires to secure State aid, it levies a money road tax for such amount that when it is added to the contribution made by the State it will equal not less than $30 per mile for all roads outside the limits of incorporated villages and cities. For towns having a valuation of less than $3,750 per mile there is a lower requirement, which is $4 per thousand of assessed value. The amount which a town may receive from the State is regulated both by the appropriation of the town and its wealth per mile of road.

The bureau of town highways, which is under the third deputy commissioner, supervises the maintenance and construction of all town highways and bridges, and audits the road accounts in every town which receives State aid. At present it has 73,000 miles of road under its supervision. Of these roads 9,000 miles are of heavy gravel or macadam, and construction of these types is progressing at the rate of about 800 miles a year. Seven-tenths of the agricultural products of the State are moved over the town highways. This bureau also does educational work through annual meetings held in each county.

A county superintendent is elected in each county by the county board of supervisors. His term of office is for 4 years and his salary and expenses are paid from county funds. If the county fails to act, the State highway commissioner may make the appointment and have the expenses paid by the State in the first instance and reimbursed by the county. The county superintendent is appointed from a civil service list of eligibles and may be removed by the State highway commissioner for a specific cause. He has charge of all road and bridge work in the county, subject to the general control of the State highway department, and is required to furnish the town superintendents with such plans or other aid as they may require. He inspects all roads once a year.

The office of town superintendent is established in every town. The town superintendent may be elected either by the town or he may be appointed by the town board. The only qualification required of him is that he be a resident of the town. The term of his office is 2 years. He is in direct charge of the maintenance and construction of all town roads and bridges subject to rules and regulations of the State highway department.

The State highway department has a bureau of research for the testing of all road-building materials. The laboratories are well equipped and a large amount of work is done by this bureau. Stone tests conducted by the bureau of research totaled 909 during the calendar year 1914; of gravel and sand 956 tests were made. The bureau tested 1,238 samples of cement and 416 samples of brick. Tests of bituminous materials amounted to 1,330, and of cubes of concrete to 1,506.

EXPENDITURES, 1914.

The total expenditure in 1914 for construction and maintenance of all roads and bridges amounted to $23,231,964 and included the following items: Expenditures by the State for construction of State and county highways, $8,363,049; by the counties for construction, $1,364,934; by the villages for construction of State and county highways, $1,185,248; by the State for maintenance of State and county highways, $3,837,727; by the State and towns for town roads, $8,113,303; by the State for the maintenance of county roads, $117,700; and by counties for maintenance of county roads, $250,000. The expenditures are shown in detail by counties in Table 10.

In 1904 the total expenditure for roads and bridges amounted to $5,692,514, including $1,056,460 contributed by the State. During the 10-year period, therefore, from 1904 to 1914 the expenditures increased 308 per cent.

TABLE 10.—*Expenditures on roads and bridges for New York, 1914.*

	Total expenditures.	Expended by State for construction.	Expended by county for construction.	Expended by village for construction.	Expended by State for maintenance.	Total amount received for all town highway purposes.[1]
Albany	$457,571.14	$97,737.48	$34,708.88	$8,697.73	$207,618.05	$108,795.00
Allegany	558,101.92	266,386.74	23,736.94	40,823.99	41,308.62	185,845.63
Broome	339,610.40	148,608.21	6,286.06	1,808.15	66,445.15	116,462.83
Cattaraugus	392,363.29	166,724.87	1,626.77	29,482.76	18,795.78	175,733.11
Cayuga	387,209.08	85,209.02	41,949,16	1,390.39	72,137.56	186,522.95
Chautauqua	374,068.02	132,226.32	30,723.58	10,975.64	11,724.14	188,418.34
Chemung	349,845.98	136,302.87	30,652.97	77,070.84	34,164.32	71,654.98
Chenango	326,190.92	111,191.66	2,616.71	24,343.03	73,865.08	114,174.44
Clinton	251,836.14	88,708.90	3,600.00	10,636.47	64,236.51	84,654.26
Columbia	277,530.73	68,360.15	36,922.22	.....	45,127.31	127,121.05
Cortland	190,206.39	87,874.74	.....	6,308.82	34,985.87	61,036.96
Delaware	562,432.43	364,390.44	4,615.27	1,411.34	21,580.82	170,434.56
Dutchess	396,862.43	80,185.09	18,000.00	26,838.75	95,514.02	176,324.57
Erie	1,006,126.26	364,753.04	78,708.12	53,131.13	262,620.04	246,913.93
Essex	397,318.08	167,897.28	41,700.00	.....	46,349.43	141,371.37
Franklin	[2] 461,428.90	170,080.82	43,841.78	.....	60,103.60	169,902.70
Fulton	181,409.38	17,916.00	11,685.91	37,821.73	62,160.80	51,824.94
Genesee	270,859.57	68,337.09	.....	68,279.41	23,844.02	110,399.05
Greene	234,846.87	92,305.27	9,681.45	2,825.95	35,041.64	94,992.56
Hamilton	154,258.49	58,937.71	2,100.00	.....	33,766.29	59,454.49
Herkimer	369,914.15	105,564.60	12,088.26	9,459.45	108,015.63	134,786.21
Jefferson	1,106,124.48	559,100.95	167,982.33	46,551.02	132,126.90	200,363.28
Lewis	237,184.53	56,647.20	4,063.05	3,470.37	34,468.12	138,535.79
Livingston	393,737.80	153,733.48	.....	40,996.91	30,935.71	168,071.70
Madison	243,057.75	102,789.49	3,128.90	.....	14,163.37	122,975.99
Monroe	615,824.41	157,748.89	65,047.64	19,391.10	175,261.81	198,374.97
Montgomery	248,257.97	41,048.97	20,463.85	58,651.57	46,624.83	81,468.75
Nassau	[3] 560,270.88	1,778.38	2,024.87	.....	48,356.12	181,911.43
Niagara	542,677.16	275,706.65	76,389.57	30,390.85	56,450.43	103,739.66
Oneida	890,249.72	462,923.68	53,773.66	33,684.78	146,369.20	193,498.40
Onondaga	542,675.42	147,378.64	60,216.38	8,572.83	153,147.01	173,360.56
Ontario	353,026.42	92,245.88	11,948.36	12,335.93	95,961.08	140,535.17
Orange	427,473.75	57,593.79	15,943.75	.....	174,409.77	179,526.44
Orleans	393,022.50	219,475.18	.....	39,074.59	44,289.60	90,183.13
Oswego	397,280.64	145,148.18	23,145.61	26,704.49	75,089.37	127,192.99
Otsego	397,156.23	173,306.23	6,346.34	2,998.44	81,809.09	132,693.13
Putnam	[4] 105,631.58	34,530.35	.....	.....	21,004.30	48,596.93
Rensselaer	576,134.13	202,333.79	84,773.45	64,372.70	136,384.82	88,269.37
Rockland	[5] 178,565.45	49,387.00	.....	.....	38,150.83	68,527.62
St. Lawrence	959,139.98	412,973.21	92,173.65	58,126.59	83,969.75	311,895.78
Saratoga	390,216.76	41,748.29	11,105.77	8,185.39	97,285.54	231,891.77
Schenectady	258,251.30	112,244.11	13,395.70	21,763.08	65,318.73	45,529.68
Schoharie	252,467.80	133,328.17	.....	9,728.01	9,937.19	99,474.43
Schuyler	123,109.33	56,706.67	5,917.82	7,617.91	8,772.23	44,094.70
Seneca	220,164.09	137,005.69	3,221.51	6,208.76	14,497.62	59,230.51
Steuben	764,981.80	387,783.43	29,848.64	23,804.95	86,968.59	236,576.19
Suffolk	772,154.58	161,168.13	7,200.00	2,618.47	70,160.79	531,007.19
Sullivan	250,462.24	61,639.95	.....	21,436.07	23,060.52	144,325.70
Tioga	226,562.73	126,428.48	.....	5,032.89	17,342.12	77,759.24
Tompkins	311,724.02	129,751.60	30,216.90	5,770.00	62,887.27	83,098.25
Ulster	387,031.30	61,732.38	43,074.26	17,271.34	103,065.00	161,888.32
Warren	179,819.29	51,333.62	16,300.00	.....	35,125.58	77,060.09
Washington	297,704.50	85,848.61	13,643.09	53,028.38	23,857.79	121,326.63
Wayne	284,890.63	95,325.99	17,623.11	2,868.98	25,859.38	143,213.17
Westchester	990,557.27	332,069.98	34,777.59	105,425.51	169,181.52	349,102.67
Wyoming	306,533.56	123,314.70	13,444.88	37,861.21	8,521.85	123,390.92
Yates	107,865.45	40,071.15	2,500.00	.....	7,509.44	57,784.86
Total	23,231,964.02	8,363,049.19	1,364,934.76	1,185,248.70	3,837,727.95	8,113,303.34

[1] Includes balance from previous year; amount collected and appropriated for roads by towns; amount received from State aid; amount collected and appropriated for bridges; purchase, repair, and storage of machinery and tools; removal of snow; and miscellaneous purposes.

[2] Includes $11,000 appropriated by county and $6,500 appropriated by State for county roads, 1914.

[3] Includes $223,000 appropriated by county and $103,200.08 appropriated by State for county roads, 1914.

[4] Includes $1,000 appropriated by county and $500 appropriated by State for county roads, 1914.

[5] Includes $15,000 appropriated by county and $7,500 appropriated by State for county roads, 1914.

ROAD AND BRIDGE BONDS.

On January 1, 1914, according to Bulletin 136, United States Department of Agriculture, the various counties and towns of New York had voted $11,729,088 road and bridge bonds, of which $9,097,923 were county bonds and $2,631,165 were town bonds. According to reports filed in the office of the State comptroller, $93,000 of bonds were voted during the year 1914, $33,000 in Albany County, and $60,000 in Oswego County. The total county and town bonds voted to the close of 1914 appears, therefore, to be $11,822,088. Of the authorized State bonds about $10,000,000 are issued annually, and the money is used for the construction of State and county highways.

ROAD MILEAGE, 1914.

At the close of the year 1914, New York State had 79,398 miles of public roads. Of this mileage, 11,986.47 are classed as State and county highways. Of the State and county highways, 6,338.9 had been surfaced as follows: Bituminous macadam, 3,168.63; plain macadam, 2,354.97; gravel, 372.97; brick, 148.53; concrete, 244.19; and other materials, 49.61. In addition to this, 500 miles are classed as county roads, all of which were surfaced with macadam, bituminous macadam, and brick. Of the 72,555 miles of town roads, 3,363 were surfaced with macadam and 5,430 with gravel. Thus it appears that 15,635.9 miles, or 19.6 per cent of the total, were surfaced at the close of the year 1914.

In 1904 only 5,876 miles, or 7.96 per cent of the total, were surfaced, while in 1909, 12,787 miles, or 16.13 per cent of the total, were surfaced. Comparing the latter figures with those obtained for 1914, it appears that during the period 1909 to 1914 the State added to its surfaced roads 2,848.9 miles, or 3.5 per cent of the total.

Detailed information showing the total mileage of public roads and the mileage improved in the various counties is contained in Table 11.

TABLE 11.—*Mileage of public roads, State of New York, 1914.*

County.	Total mileage all roads in county.	State and county highways.							County roads.	Town roads.[1]
		Bituminous macadam.	Plain macadam.	Gravel.	Brick.	Concrete.	Other materials.	Total State and county highways.		
Albany	1,098	58.00	121.24	.....	2.45	0.47	.....	182.16	.....	915.84
Allegany	1,894	48.06	4.68	.....	2.73	15.20	[2] 7.91	78.58	.....	1,815.42
Broome	1,437	68.845	61.887	.....	1.86	.....	.....	132.592	.....	1,304.408
Cattaraugus	1,978	48.57	11.52	.....	.....	9.50	.....	69.59	.....	1,908.41
Cayuga	1,490	55.07	45.67	.....	.10	.....	.....	100.84	.....	1,389.16
Chautauqua	1,950	17.76	4.104	.....	22.02	24.12	.....	68.004	.....	1,881.996
Chemung	875	25.15	33.228	.....	5.47	.....	.....	63.848	.....	811.152
Chenango	1,746	45.67	52.364	.....	6.35	.....	.....	104.384	.....	1,641.616
Clinton	1,384	68.78	70.94	.....	.....	.....	.....	139.72	.....	1,244.28
Columbia	1,379	56.75	24.29	6.67	.....	.....	.....	87.71	.....	1,291.29
Cortland	1,037	24.54	50.17	.....	.11	.....	.....	74.82	.....	962.18
Delaware	2,358	100.33	14.70	1.00	.....	.....	.....	116.03	.....	2,241.97
Dutchess	1,617	71.69	52.361	.....	.....	.....	.....	124.051	.....	1,492.949
Erie	1,883	37.01	147.88	.....	53.93	20.69	.....	259.51	.....	1,623.49
Essex	1,306	108.83	28.77	.....	.....	.....	.....	137.60	.....	1,168.40
Franklin	1,367	61.82	14.92	.....	.79	.27	.....	77.80	[3] 130	1,159.20
Fulton	769	36.33	25.05	.....	.....	.....	.....	61.38	.....	707.62
Genesee	920	20.79	14.35	.....	.27	.....	.....	35.41	.....	884.59
Greene	1,062	69.96	4.48	.....	.....	.....	.....	74.44	.....	987.56
Hamilton	444	35.74	14.18	.....	.....	.....	.....	49.92	.....	394.08
Herkimer	1,454	31.85	74.22	.....	.....	2.41	.....	108.48	.....	1,345.52
Jefferson	2,204	114.95	98.411	.....	.58	3.01	.....	216.951	.....	1,987.049
Lewis	1,448	56.57	4.58	.....	.23	8.08	.....	69.46	.....	1,378.54
Livingston	1,285	56.45	31.18	.....	.....	.....	.....	87.63	.....	1,197.37
Madison	1,424	41.87	34.31	.....	.....	2.88	.....	79.06	.....	1,344.94
Monroe	1,368	74.11	162.66	.....	12.26	3.25	.....	252.28	.....	1,115.72
Montgomery	849	40.26	56.61	.....	.....	.....	.....	96.87	.....	752.13
Nassau	1,491	28.745	14.99	.....	.....	6.58	.....	50.315	[4] 287	1,153.685
Niagara	934	46.20	21.47	.....	16.73	26.96	.....	111.36	.....	822.64
Oneida	2,317	93.70	112.86	.....	.....	3.43	.....	209.99	.....	2,107.01
Onondaga	1,635	132.21	46.22	.....	.76	6.7	.....	185.89	.....	1,449.11
Ontario	1,348	42.40	80.13	246.06	.61	.18	.....	369.38	.....	978.62
Orange	1,595	58.79	80.87	93.12	.....	.....	[5] 8.76	241.54	.....	1,353.46
Orleans	720	24.92	23.12	.....	2.59	18.17	.....	68.80	.....	651.20
Oswego	1,714	76.65	21.86	7.31	.....	12.81	.....	118.63	.....	1,595.37
Otsego	2,153	55.95	69.80	.....	.47	.....	.....	126.22	.....	2,026.78
Putnam	509	45.41	5.9	.....	.....	1.64	.....	52.95	[6] 11	445.05
Rensselaer	1,291	75.09	80.19	12.39	.....	1.95	[6] 3.15	172.77	.....	1,118.23
Rockland	371	19.37	16.18	.....	.....	3.75	.....	39.30	[6] 76	255.70
St. Lawrence	3,101	174.90	16.50	.....	1.25	.....	[5] 3.89	196.54	.....	2,904.46
Saratoga	1,521	57.76	41.82	6.06	1.00	.....	.....	106.64	.....	1,414.36
Schenectady	413	31.56	24.91	.....	.30	6.76	[6] .11	63.64	.....	349.36
Schoharie	1,259	14.81	18.68	.....	.....	.....	.....	33.49	.....	1,225.51
Schuyler	762	22.62	1.11	.....	.....	8.98	.....	32.71	.....	729.29
Steuben	3,094	94.48	42.79	.....	8.98	.27	[2] 4.1 [6] 5.5	156.12	.....	2,937.88
Seneca	704	36.59	6.75	.....	.....	.70	.....	44.04	.....	659.96
Suffolk	1,953	83.92	11.77	.....	.....	28.42	.....	124.11	.....	1,828.89
Sullivan	1,844	45.98	16.07	.....	.....	.....	[7] 8.34	70.39	.....	1,773.61
Tioga	1,067	35.74	13.53	.....	1.63	.....	.....	50.90	.....	1,016.10
Tompkins	1,091	47.60	44.98	.....	.39	7.60	.....	100.57	.....	990.43
Ulster	1,848	46.90	106.09	.....	1.17	.....	.....	154.16	.....	1,693.84
Warren	1,010	53.97	37.63	.....	.....	.....	.....	91.60	.....	918.40
Washington	1,533	48.35	19.23	.36	.....	.....	.....	67.94	.....	1,465.06
Wayne	1,348	36.94	15.11	.....	.....	11.85	.....	63.90	.....	1,284.10
Westchester	908	104.22	92.67	.....	2.43	4.04	.....	203.36	.....	704.64
Wyoming	1,069	32.88	.....	.....	.....	.....	[2] 7.85	37.00	.....	1,032.00
Yates	769	24.22	12.99	.....	.60	3.52	.....	45.53	.....	723.47
Total	79,398	3,168.63	2,354.97	372.97	148.53	244.19	49.61	6,338.90	504	72,555.095

[1] Constant progress is being made in the matter of permanently improving town highways. At the close of the year 1914 there had been constructed a total of 3,363 miles of town macadam and 5,430 miles of gravel. All town roads, with the exception of about 2 per cent, have been improved in some manner.

[2] Slag.

[3] Macadam.

[4] Brick, bituminous macadam, and macadam.

[5] Shale.

[6] Earth.

[7] Granite.

PENNSYLVANIA.[1]

Pennsylvania, with an area of 44,832 square miles, has 2.22 miles of road per square mile of area, and a population, according to the census of 1910, of 7,665,111, which makes her the second largest State in the Union in point of population, while there are 33 other States having larger areas. It has 67 counties, varying in size from Center, the largest, with an area of 1,146 square miles, to Montour, the smallest, with an area of 130 square miles. Pennsylvania's topography is quite diversified, about one-fourth of the area being covered by hills and mountains. It has a number of large rivers, among which are the Schuylkill, the Susquehanna, the Monongahela, and the Allegheny.

Pennsylvania has a highly organized highway department, with offices located in the State capitol at Harrisburg. The organization of the department is as follows: Commissioner, first deputy, second deputy, chief engineer, construction engineer, auditor, statistician, automobile division registrar, chief clerk, engineer of tests, engineer of bridges, and chief draftsman. There are 15 assistant engineers in charge of the 15 districts into which the State is divided.

The State highway department is at present operating under what is known as the "Sproul Act." Under this act, 375 routes, containing approximately 10,200 miles, are designated as State highways. Toll roads included in State highways are purchased by the State. Contracts are awarded by the State highway department on plans and specifications prepared by the department. All State highways are improved to a width of 12 feet. The maintenance of the roads improved as State highways is taken care of by the State highway department, except that under certain conditions boroughs and incorporated towns through which State highways lie pay 50 per cent of the cost of maintenance.

Railways, railway crossings, gas or water pipes, and electric conduits are not allowed to be laid on State highways without permits. Neither may telegraph, telephone, electric light, or power poles be erected on such highways without special permission from the State highway department.

The department also is required to give aid in the improvement of certain roads which are not included in the State highway system. Under this provision of the law, counties and townships, by application, may receive from the State not to exceed 50 per cent of the cost of improvement of roads within the limits of such counties or townships, and for maintenance of such roads thereafter. The basis of apportionment of State aid to counties and townships is the mileage

[1] W. R. D. Hall, the statistician of the Pennsylvania highway department, rendered valuable assistance in this connection.

of highways in such units. These State-aid highways are maintained by the State highway department, and 50 per cent of the cost of such maintenance is repaid by the townships or counties in which the roads are situated.

In 1911, $3,000,000 was appropriated under the Sproul Act for the maintenance, repair, and construction of State highways, and for the State's share of maintenance of State-aid highways. One million dollars was appropriated for the improvement of roads designated as State-aid highways.

The legislature of 1915 appropriated $8,300,000 to the State highway department for the two years ending June 1, 1917. Of this appropriation $6,000,000 is for the construction and maintenance of State highways; $250,000 is for the purchase or condemnation of turnpikes which are included in the State highway system; $500,000 is for the State's share in the construction and maintenance of State-aid highways; $50,000 is for the repair and maintenance of the Old Cumberland Road, and $1,500,000 is to cover a portion of the deficiency on the repayment of a cash-tax bonus to the townships for previous years. This repayment of the cash-tax bonus is a function of the bureau of township highways. The State highway department's care of this fund is merely custodial. Previously, money derived from motor-vehicle licenses had been given to the State highway department, in addition to the money appropriated by the legislature; but in the latter act of the legislature the following proviso is found:

> *Provided*, That the appropriation made by this act shall include and not be in addition to the amounts received by the Commonwealth during the two fiscal years beginning June 1, 1915, for the licensing of motor vehicles and drivers, under the act of July 7, 1913.

Therefore, the money derived from motor-vehicle licenses is included in the appropriation of $8,300,000, and is not in addition thereto.

In 1913 a bureau of township highways was established in the highway department, under supervision of one of the deputies, and has general supervision over all township and highway bridges on which State-aid money has been expended. The bureau also has charge of the administration of township highways through the various division engineers. The township supervisors report annually to the bureau of township highways relative to the number of miles of township roads and the money derived for road purposes through taxation. The bureau then grants each township 50 per cent of the total amount of road tax collected in the township, provided that no township shall receive in any one year to exceed $20 per mile of township road. Work done in the townships under this law is in accordance with regulations prescribed by the State highway department.

There are 45 "first-class" townships which do not come within the jurisdiction of the bureau of township highways. A first-class township is one having a population of more than 300 to the square mile. Road work in these townships is under the supervision of boards of township commissioners, who have absolute control over all road work and the collection and expenditure of road funds within their respective townships. The majority of these townships are included within the limits of incorporated cities and boroughs, and consequently have no country roads.

A few of the counties also have what are known as county roads, which are improved and maintained solely at the expense of the counties in which they are located.

Bonds may be issued by counties or townships to secure funds for road improvement or maintenance. At present bond issues for road improvement can not be made by the State, but for some time efforts have been made to amend the constitution in this connection.

In 1911, and again in 1913, the legislature passed an amendment to the constitution permitting the State to issue $50,000,000 in bonds for road improvement. The amendment was then brought before the people for ratification at the election in November of that year and was defeated by a majority of 40,000. Again, in 1915, the legislature passed an amendment and, as before, this will be passed upon by the next legislature, and if so passed it will be submitted to the people at the fall election in 1918. This procedure is in accordance with constitutional provisions.

EXPENDITURES, 1914.

It was impracticable to secure complete information regarding taxation and revenues from the various counties and townships in Pennsylvania. A summary of expenditures for the State as a whole, including expenditures in first-class townships, was, however, obtained from the State highway department and is as follows:

Expenditures by second-class townships	$5,500,091
Joint funds, State, counties, and townships	2,634,205
Road work done solely at State expense	2,290,284
Total expenditures by State, counties, and townships	10,424,580

In 1904 the total expenditures for public roads by the State, counties, and townships aggregated $4,887,266, and the increase in 1914 as compared with 1904 was, therefore, 113.2 per cent.

ROAD AND BRIDGE BONDS.

On January 1, 1914, the various counties and townships had voted $27,172,659 of road and bridge bonds, of which $24,839,050 were county bonds and $2,333,609 were township bonds. For the year

1914, reports were received from only one township and two counties, showing additional bonds voted. These were as follows:

Allegheny County, Shaler Township	$25,000
Lackawanna County	100,000
Westmoreland County	250,000
Total	375,000

By adding these three issues to the total given above it appears that the total bonds voted up to and including the year 1914 aggregate $27,547,659. Owing to the incomplete returns from counties and townships for 1914, it is impossible to say whether this includes all bonds voted.

ROAD MILEAGE, 1914.

In Table 12 it will be seen that at the close of 1914, Pennsylvania had 91,555.84 miles of public roads. Of this total, 10,235.5 miles were classed as State roads, 80,376.31 as second-class township roads, 583.87 as county roads not on the State highway system, and 164.08 as first-class township roads. The county roads and the first-class township roads are not included in the table, except in the total mileage column.

The portions of State highways passing through boroughs have been included in the table and are shown separately from other roads. While these highways lie within incorporated limits of boroughs, their construction and maintenance is by the State highway department, since they are the connecting links of these State highway routes which pass through the boroughs.

Of the State highways, 2,942.26 miles, or 28 per cent, were surfaced as follows: 1,881.8 plain macadam, 198.33 bituminous macadam, 269.33 brick, 235.19 gravel, and 367.6 with other materials, such as concrete, stone block, flint, and stone. Of the county roads, all were surfaced, making a total mileage of 583.87 not included among State highways. These are not shown in the table, but are distributed as follows: 485.72 miles in Allegheny County; 32 miles in Cumberland County; 26.8 miles in Lackawanna County; 2.12 miles in Lehigh County; 4 miles in McKean County; and 13.23 miles in Westmoreland County. Of the roads in first-class townships, not on State highways and not shown in the table, 46.75 miles are distributed as follows: 21.75 miles in Allegheny County and 21 miles in Montgomery County. Of the second-class township roads, it is estimated that about 8 per cent, or 6,430 miles, was surfaced with some kind of hard material. It thus appears that of the total mileage of all roads, 9,982.88 miles, or 10.9 per cent, were surfaced at the close of 1914.

In 1904 only 2,160.8 miles, or 2.17 per cent, of the total mileage, were reported as surfaced, while in 1909, 3,364.76 miles, or 3.84 per cent, were surfaced. It appears, therefore, from these comparisons that during the 5-year period 1909–1914, 6,618 miles, or about 7 per cent of the total mileage, were surfaced.

TABLE 12.—*Mileage of public roads, State of Pennsylvania, 1914.*

County.	Miles of public road.									Miles of State highways surfaced.									
	Total road mileage.		Total State highways.		Toll roads on State highways.		County roads on State highways.		Second-class township roads.	Macadam.		Bituminous macadam.		Brick.		Gravel.		Other materials.	
	County.	Borough.	County.	Borough.	County.	Borough.	County.	Borough.		County.	Borough.	County.	Borough.	County.	Borough.	County.	Borough.	County.	Borough.
Adams	1,221.24	16.23	140.22	16.23	16.85	3.29	7.87	.....	1,078.02	42.78	11.10	.....	1.61	.....	.....	.....	.....	.....	.....
Allegheny	2,020.86	24.83	136.11	24.83	.....	.....	82.54	.....	1,265.28	.....	4.58	6.38	.....	.....	15.60	.....	.....	[1] 1.06	[1] 1.98
Armstrong	1,815.72	12.74	138.42	12.74	.....	.....	.....	.....	1,677.30	7.40	.40	.....	.....	3.91	4.26	.....	.....	.....	.....
Beaver	1,153.36	17.84	117.48	17.84	.....	.....	.....	.....	1,035.88	1.12	.....	.....	.....	1.98	8.88	.....	.....	.....	.....
Bedford	1,942.39	9.27	237.99	9.27	.....	.....	.....	.....	1,704.40	42.35	5.96	.....	.....	.....	.12	.....	.....	.....	.....
Berks	2,498.50	20.85	194.11	20.85	13.60	2.18	.....	.....	2,295.39	106.92	15.19	4.34	.....	.....	.59	20.78	1.15	.....	[2] .87
Blair	760.38	11.45	81.88	11.45	3.54	.43	.....	.....	678.50	48.55	3.07	5.05	.53	.....	6.29	.....	.....	.....	[3] .29
Bradford	2,552.42	18.35	177.18	18.35	.19	.....	.....	.....	2,375.24	14.34	3.73	.....	.....	.....	2.37	.....	.....	.....	.....
Bucks	1,899.26	20.41	185.85	20.41	60.41	6.79	.....	.....	1,693.66	57.92	11.42	8.63	.50	.....	.03	14.31	1.41	[3] .10	.....
Butler	1,861.17	25.24	154.45	25.24	.....	.....	.....	.....	1,706.72	7.87	.....	.....	.....	.84	6.46	.....	.....	.....	.....
Cambria	1,210.36	24.54	140.96	24.54	3.64	.....	.....	.....	1,069.40	14.57	1.56	.....	.....	1.28	12.44	.....	.....	.....	.....
Cameron	166.63	4.35	50.38	4.35	.....	.....	.....	.....	116.25	1.15	.48	.....	.....	.....	.14	.....	.....	.....	.....
Carbon	524.19	15.17	34.60	15.17	.....	.....	.....	.....	489.59	14.30	1.46	.....	.08	.....	1.91	4.75	4.54	.....	{[3] .15 [2] .95
Center	1,223.25	10.47	214.04	10.47	7.93	.....	.....	.....	1,003.71	40.02	2.96	.....	1.17	.06	.81	.....	.....	[2] 74.37	[2] 1.91
Chester	2,560.41	25.70	262.50	25.70	4.77	.....	.....	.....	2,297.91	130.79	20.66	14.99	.60	.....	.....	.....	.....	.....	[3] 1.15
Clarion	1,410.98	15.53	127.10	15.53	.....	.....	.....	.....	1,283.88	4.57	.56	.....	.....	.....	2.28	.....	.....	.....	.....
Clearfield	1,755.78	30.25	145.40	30.25	.....	.....	.....	.....	1,610.38	10.18	.....	2.02	.....	3.47	6.58	.....	.....	.....	.....
Clinton	642.99	8.97	110.87	8.97	.....	.....	.....	.....	532.12	13.12	1.23	.....	.....	.....	.99	.....	.....	[2] 6.31	[2] 1.59
Columbia	1,346.15	18.38	109.15	18.38	.....	.....	.38	.....	1,237.00	11.04	2.20	.....	.56	.....	3.13	19.36	1.38	.....	.....
Crawford	2,263.57	17.43	198.64	17.43	.....	.....	.....	.....	2,064.93	14.81	1.06	.....	.53	.77	1.31	1.14	.....	.....	.....
Cumberland	1,300.00	12.74	110.32	12.74	.....	.....	.....	.....	1,157.68	65.45	11.78	1.18	.....	.44	.96	.....	.....	.....	.....
Dauphin	995.90	18.64	101.72	18.64	5.00	.....	.....	.....	894.18	32.88	14.68	3.81	.....	.25	.71	.....	.....	.....	[1] 1.92
Delaware	347.67	16.80	85.59	16.80	14.68	5.35	.....	.....	262.08	47.25	5.64	10.35	2.66	.96	1.45	.....	.....	.....	{[2] .32 [3] 1.07
Elk	584.65	7.99	81.51	7.99	.....	.....	.....	.....	503.14	3.90	.....	8.55	.....	.....	2.32	.....	.....	.....	.....
Erie	1,749.22	17.94	196.67	17.94	.....	.....	.....	.....	1,552.55	10.77	.58	3.50	.....	3.92	4.06	.....	.....	.....	.....
Fayette	1,759.60	12.23	140.33	12.23	.....	.....	.....	.....	1,619.27	32.80	.88	11.03	.....	3.20	8.67	.....	.....	.....	.20
Forest	374.80	2.46	73.30	2.46	.....	.....	.....	.....	301.50	.....	.....	.....	.....	1.67	2.00	.....	.....	.....	.....
Franklin	1,466.39	11.17	168.05	11.17	29.26	3.66	.....	.....	1,291.21	78.02	6.40	.68	.33	.....	.78	.....	.....	.....	.....

[1] Stone block. [2] Stone. [3] Concrete.

TABLE 12.—*Mileage of public roads, State of Pennsylvania, 1914*—Continued.

County.	Miles of public road.									Miles of State highways surfaced.									
	Total road mileage.		Total State highways.		Toll roads on State highways.		County roads on State highways.		Second-class township roads.	Macadam.		Bituminous macadam.		Brick.		Gravel.		Other materials.	
	County.	Borough.	County.	Borough.	County.	Borough.	County.	Borough.		County.	Borough.	County.	Borough.	County.	Borough.	County.	Borough.	County.	Borough.
Fulton	755.47	0.86	133.47	0.86	3.32				622.00	19.80	0.86								
Greene	1,522.78	5.51	103.88	5.51					1,418.90	5.95				4.95	3.53				
Huntingdon	1,484.97	11.49	204.62	11.49					1,276.35	49.25	3.57	4.36			.71				
Indiana	2,072.22	14.00	194.97	14.00	2.18				1,877.25	17.10	.15				3.26				
Jefferson	1,321.79	20.51	137.53	20.51					1,184.26	2.42	.45	2.60		4.34	9.95				
Juniata	828.28	2.39	104.08	2.39			0.13		724.20	6.56	1.21	6.58			.10			[1] 24.94	
Lackawanna	652.06	44.36	58.86	44.36	4.37	0.79			558.40	16.71	4.51	2.47	11.32		5.88	6.90			
Lancaster	3,074.49	19.69	229.57	19.69	70.67	3.03			2,769.29	27.60	12.46	3.68	.58			.51		{[2] 64.39 / [3] .31}	[3] 3.27
Lawrence	897.30	6.03	79.17	6.03					818.13	5.57				.16	1.22				
Lebanon	855.37	5.10	81.97	5.10	19.67				773.40	34.13	5.10								
Lehigh	1,175.56	4.48	71.36	4.48	3.37				1,102.08	15.19	3.66	4.86	.12		.70			[2] 11.37	
Luzerne	1,262.13	30.51	164.93	30.51			21.54		1,097.20	30.71	3.34		1.23	.51	15.95	33.24	1.91		
Lycoming	1,833.11	16.35	263.70	16.35			.30	0.09	1,565.41	10.07	.22	8.24	.94	.55	4.55				
McKean	845.67	13.25	174.52	13.25					652.15	7.17		1.56			3.38				
Mercer	1,727.61	23.58	142.88	23.58					1,584.73	15.97	.09	4.62	.27	1.51	8.60				
Mifflin	535.75	4.85	77.76	4.85	3.80	1.29			457.99	18.47	1.60	4.38			1.96			{[2] 4.43 / [1] 2.24}	
Monroe	1,018.90	9.55	139.44	9.55					879.46	36.59	6.52				.92	6.70			
Montgomery	1,721.49	27.18	202.47	27.18	55.32	6.77			1,429.96	118.64	17.47			.03	1.41			[3] 2.74	
Montour	355.93	2.47	31.67	2.47			.13		324.26	5.71	.89				.89				
Northampton	1,107.29	14.67	75.28	14.67			7.75	.02	1,032.01	26.11	10.54		2.66		.04	4.43	1.12	{[2] 4.10 / [3] 37.37}	[3] 3.29
Northumberland	1,099.63	20.68	137.33	20.68			.79		962.30	17.50	2.98	7.55		1.98	7.00	3.31	1.44		
Perry	1,065.06	11.22	126.28	11.22					938.78	6.15	6.23							[1] 9.82	[1] .85
Pike	588.81	2.05	123.77	2.05					465.04	1.54						23.83			
Potter	1,126.90	13.27	140.49	13.27					986.41	6.70	4.20	.74	.64		1.58				
Schuylkill	1,348.90	30.61	132.57	30.61					1,216.33	30.86	13.72		1.00		6.05	20.74	3.25	[2] 18.42	
Snyder	795.88	2.52	82.35	2.52			.32		713.53	3.59			.90		.28			{[3] .35 / [1] 47.55}	[1] 1.34
Somerset	2,253.74	15.65	192.28	15.65	8.13				2,061.46	{* .51 / 31.69}	{* .30 / 2.24}	*4.00			2.96				
Sullivan	582.23	5.97	101.60	5.97					480.63	4.72									

Susquehanna	2,142.05	18.58	209.31	18.58					1,932.74	7.02	1.27	6.36	1.85		1.35	8.86	2.40		
Tioga	1,905.53	21.81	168.13	21.81					1,737.40	14.60	3.30				4.64				
Union	544.66	4.91	70.86	4.91			7.21		473.80	7.51	1.04	3.43			.14			[1] 14.76	[1] 2.30
Venango	1,207.25	5.38	139.38	5.38					1,067.87	1.75				8.33	.49				
Warren	1,149.90	13.81	143.41	13.81					1,006.49	7.40		4.27	.74	.30	3.82				
Washington	2,298.30	43.21	185.50	43.21			23.06	.25	2,112.80	* 5.14 33.05	* 1.04 6.50	9.45		.09	23.44				
Wayne	1,500.99	15.17	132.21	15.17			.99		1,368.78	27.65	3.09				1.32	4.86	1.24		
Westmoreland	2,865.47	23.73	247.44	23.73	8.32		1.58		2,604.80	82.51	.01			.18	12.00				
Wyoming	768.26	8.01	96.16	8.01					672.10	3.83	.99					21.52	.11		[3] 1.67
York	2,851.81	23.08	215.02	23.08	55.66	5.71			2,630.45	12.51	3.85	4.56	3.29		.39			[2] 38.04	[2] 6.82
Total	90,551.38	1,004.46	9,231.04	1,004.46	394.68	39.29	154.59	.36	80,376.31	1,630.82	250.98	164.22	34.11	45.68	223.65	215.24	19.95	328.67	28.94
Grand total	[4] 91,555.84		10,235.50		433.97		154.95		80,376.31	1,881.80		198.33		269.33		235.19		[5] 357.61	

[1] Flint.
[2] Stone.
[3] Concrete.
[4] Includes mileage of toll roads not on State highways as follows: Adams, 3; Berks, 9; Bucks, 19.75; Center, 5.5; Franklin, 7.13; Huntingdon, 4; Lackawanna, 7; Lancaster, 75.63; Montgomery, 58.73; and York, 6.34; or a total of 196.08 miles.
[5] Comprising 5.28 miles of stone block, 236.80 miles of stone, 11.69 miles of concrete, and 103.8 miles of flint.
* National road.

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